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PROGRAMME, THE ENVIRONMENT FUND AND ADMINISTRATIVE AND OTHER BUDGETARY MATTERS

Mercure satellite communications system: report on a full review and cost-benefit analysis of the system and the experience gained in its initial operation.

Report by the Executive Director

Summary

The present report has been prepared in response to Governing Council decision 19/30, to review the experience gained in the initial operation of the Mercure satellite communications system. It also provides a preliminary cost-benefit analysis of Mercure global services since the system attained full operational status at the end of April 1998. Thus, while a comprehensive cost-benefit analysis would normally have covered at least 12 months of Mercure global operation, this covers only a limited period. Delays in receiving the Intelsat authorization required to operate the satellite earth stations at United Nations Environment Programme (UNEP) headquarters in Nairobi, the conclusion of negotiations with the Government of Kenya and the Kenya Posts and Telecommunications Corporation (KPTC) regarding a Mercure services agreement, and delays in achieving full operational status of some remote earth stations militated against full global operation of Mercure until late June 1998. The rescheduling of the twentieth session of the UNEP Governing Council from May to February 1998 has further reduced the time available to achieve a reasonable period for assessing the full costs and benefits associated with Mercure.

The focus of UNEP, since February 1998, has been on consolidating the operational network of 15 Mercure installations worldwide, seeking to integrate the system more effectively with the United Nations global telecommunications network and, accordingly, to achieve authorization for

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voice telephony over Mercure and access to the system by all United Nations agencies in Nairobi. Full integration of data services has already been achieved with the United Nations global network and, where negotiations with the Government of Kenya and KPTC are concerned, UNEP is currently waiting for details on the terms and conditions under which voice and access to the system by other United Nations agencies would be agreed and put into operation.

Notwithstanding the time constraints, projected costs and benefits have been assessed by taking into account the existing and anticipated patterns of telecommunications usage of the globally located UNEP secretariat and its partners. The analysis overwhelmingly indicates, for the level of services provided, that Mercure is already cost-effective in delivering data, internet, videoconference and facsimile services and will be even more so when voice telephony is added in the future.

Suggested action by the Governing Council

The Governing Council may wish to:

1. Recall its decisions 17/38 of 21 May 1993, 18/47 of 25 May 1995 and 19/30 of 7 February 1997;

2. Take note of the report of the Executive Director;

3. Express once again its gratitude to the donors for their generous contribution to the initial Mercure configuration, which currently facilitates access by the United Nations Environment Programme and its partners to data, internet, videoconference and facsimile services, enhancing the organization's capability to fulfil its mandate for the delivery of environmental data and information in a timely, cost-effective and efficient manner;

4. Express its gratitude to the Government of the Republic of Kenya for hosting and authorizing the operationalization of the Mercure facilities at UNEP headquarters;

5. Express its gratitude to all host countries of the Mercure stations for their ongoing support and willingness to participate in the project to operate the earth stations;

6. Express its gratitude to the Government of Norway for its generous contribution to the United Nations Environment Programme to establish and maintain the UNEPnet Implementation Centre in Arendal, Norway, essential to the successful operation and maintenance of Mercure and UNEPnet;

7. Encourage the Executive Director to maximize the cost-effectiveness of the Mercure network by achieving optimal integration with the United Nations global telecommunications system, particularly with regard to the availability of voice telephony and the sharing of all Mercure services with United Nations agencies in Nairobi;

8. Encourage the Executive Director, with special regard to the provisions of paragraph 5 of the present decision, to endeavour to reach an

early conclusion of the negotiations with the Government of Kenya seeking authorization of voice telephony over Mercure and access to the system by all United Nations organizations in Nairobi;

9. Encourage the Executive Director to continue to make the UNEPnet/Mercure system available for utilization by the United Nations telecommunications system and other organizations in the United Nations system on a cost-sharing basis at sites where technically and economically feasible;

10. Authorize the Executive Director to expand co-funded efforts with partner organizations of the United Nations Environment Programme for the continued implementation, operation and utilization of UNEPnet/Mercure;

11. Authorize the Executive Director to engage in collaborative programmes with other donors to provide for the continuing development of the UNEPnet infrastructure through extra-budgetary support;

12. Request the Executive Director to ensure that a comprehensive review and cost-benefit analysis of the UNEPnet/Mercure system, including the UNEPnet Implementation Centre, be presented to the Governing Council at its next session, allowing time for the full impact of operationalizing the network to be measured in terms of efficiency and cost-benefit;

13. Encourage countries with relevant environmental data and information assets of value for improved environmental monitoring and management to make them readily accessible to all countries, especially developing countries, for ease of delivery through this initiative of the United Nations Environment Programme.

I. BACKGROUND TO THE MERCURE PROJECT

1. In paragraph 10 of its decision 19/30 of 7 February 1997, the UNEP Governing Council requested the Executive Director, once the Mercure system was fully operational, to ensure that a full review and cost-benefit analysis of the system and the experience gained in its initial operation was carried out and to submit a report thereon to the Council at its twentieth session.

2. The present report is prepared in response to the that request, but only provides an indicative cost-benefit analysis because of delays in the Intelsat authorization to operate the satellite earth stations at UNEP headquarters in Nairobi, extended negotiations with the Government of Kenya and KPTC regarding a Mercure services agreement, and delays in achieving full operational status of some remote earth stations in the network. The Mercure stations at UNEP headquarters did not become operational in effect until the end of April 1998 and persistent service faults at several remote installations meant that their connectivity remained at technically unacceptable levels until June 1998. The bringing forward of the twentieth session of the UNEP Governing Council from May to February 1999 has further reduced the time available to achieve a reasonable period for assessing the full costs and benefits associated with Mercure. Some services offered by Mercure are also new to the secretariat, further complicating the scope of the current analysis.

3. The Mercure satellite telecommunications system was designed in the early 1990s by six countries of the European Space Agency (ESA) in response to the call in chapter 40 of Agenda 21, to utilize modern electronic telecommunications to improve access to, and the exchange of, environmental data and information for responsible decision-making concerning the environment. Particular emphasis was placed at the time on demonstrating the data and information exchange potential of satellite communications in developing countries, streamlining the database transfer and exchange requirements of the UNEP Global Resource Information Database (GRID), and raising the efficiency of the globally distributed UNEP secretariat and its cooperating partners through access to advanced telecommunications facilities.

4. The six European donor countries (Austria, Belgium, Norway, Spain, Switzerland and the United Kingdom of Great Britain and Northern Ireland), from the outset of the Mercure project, assigned responsibility for the design, management oversight and implementation of the project to ESA. Total investment in the Mercure project by the European donors was estimated at the time to be approximately $14 million. The proposed responsibility of UNEP under the project agreement was to provide the umbrella and rationale for implementation of the project and to make provision for certain operational costs, such as leased capacity on the Intelsat satellite transponders serving both the Atlantic Ocean region and the Indian Ocean region. Two classes of satellite earth stations were incorporated in the Mercure design: one to accommodate the high capacity communications requirements of major UNEP destinations (A-class stations operating at a capacity of 384 kilobytes per second), such as its headquarters in Nairobi, and the other to meet the needs of destinations such as cooperating agencies in developing countries where portability, ease of installation and low maintenance requirements were deemed the priority (B-class stations operating at 32 kilobytes per second

capacity). Under the project agreement, UNEP also agreed to contract the Swiss posts and telecommunications service, PTT (subsequently Swisscom), to provide the satellite network monitoring and control via the Mercure hub station located in Leuk, Switzerland.

5. In May 1993, by its decision 17/38 of 21 May 1993, the Governing Council requested the Executive Director to seek agreement with ESA for the acceptance of the Mercure donation. Following extended consultation with the Department of Administration and Management and the Office of Legal Affairs at the United Nations Headquarters, an agreement to effect the Mercure project was signed by the Director General of ESA and the Executive Director of UNEP in November 1994. This decision was subsequently endorsed by the Governing Council in its decision 18/47 of 25 May 1995.

6. Funding of Mercure implementation in UNEP began in 1995, with the approval of $1,117,000 from the Environment Fund reserve to cover activities of a specific project during the period 1995-1996. A further budget of $1,995,000 was approved for the Mercure project by the Governing Council at its eighteenth session, for the 1996-1997 biennium. Recognizing both the programmatic and administrative service potential of Mercure, funds were allocated as follows: $1,295,000 to the programme budget; and $700,000 to the management and administrative support costs (MASC) budget. For the 1998-1999 biennium, continuation of the Mercure project was approved to a total of $1,400,000, with only $700,000 available from the programme budget.

7. To meet the potential shortfall of programme funds for UNEPnet/Mercure in 1998-1999, and to render implementation of Mercure project viable throughout the biennium, the Executive Director was authorized by the Governing Council in its decision 19/30 of 7 February 1997 to engage in collaborative programmes with other donors to provide for the continuing development of UNEPnet/Mercure infrastructure through a collaboration co-funded by the United Nations Environment Programme and other donors. In the last quarter of 1997, an initiative between the Government of Norway and UNEP established the UNEPnet Implementation Centre in Arendal Norway (see paragraph 21 below for details) in response to this request, resulting in a jointly funded project to deliver the UNEPnet/Mercure programme objectives throughout the biennium 1998-1999 and beyond. The Technical Cooperation Trust Fund in support of the UNEPnet Implementation Centre Project financed by Norway calls for an annual contribution of $700,000 from both UNEP and Norway (a total of $1.4 million per annum) up to the end of 2001. Because of financial constraints in 1998, only $500,697 was allocated from the programme budget for UNEPnet/Mercure in 1998. This was supplemented by an addition in 1998 of $650,000 from the Fund programme reserve, to cover both the agreed UNEP contribution to the trust fund project and to ensure that other UNEPnet objectives outlined in the internal UNEPnet/Mercure project were achieved. The same level of allocation from the Environment Fund will be maintained in 1999.

8. During the evolution of Mercure, a satellite telecommunications concept known as the "United Nations backbone" system came under consideration in New York, with a view to servicing the telecommunications requirements of the United Nations and its outposted offices, particularly the system-wide need for voice telephony. UNEP and the Electronic Services Division of the United Nations Secretariat spent considerable time and effort between 1994 and 1996

to avoid any potential duplication of intended services during the development of both systems. Mercure being designed, first and foremost, as a purpose-driven data network, it was assumed at the time that overlap of services would be largely avoided. During the development of Mercure, however, increasing emphasis was placed on reducing the composite telecommunications costs of UNEP by adaptation of the system to accommodate voice telephony. This raised the potential for some duplication of services with the proposed United Nations backbone system and also heightened awareness of possible legal issues to be addressed in relation to the carriage of voice traffic at particular locations within the network, especially at UNEP headquarters in Nairobi.

9. Negotiations with the Government of Kenya on this latter concern are still under way, but the possibility of duplication of services with the United Nations Backbone system diminished considerably in February 1997 when the Secretary-General delivered his report to the General Assembly on telecommunications in the United Nations (A/C.5/51/46), effectively terminating the United Nations backbone initiative. The report stated that the Secretary-General also intended to pursue the integration of the then current United Nations global network with the Mercure network. The United Nations Office of Internal Oversight Services (OIOS) also made reference in 1997, in its review of UNEP (16 October 1997 Audit of the UNEP Mercure Project AFC/7/26/2), to the need for greater integration of Mercure with the redefined United Nations global telecommunications network, a system now comprising primarily leased line connections and out-sourced telecommunications services provided by commercial operators (with the exception of the United Nations peace-keeping network). UNEP and the United Nations Informations Systems Technology Division (formerly the Electronic Services Division) in New York have, as a result, worked consistently to achieve integration to the maximum degree possible and so avoid duplication of services. Both parties agreed in early 1998 that a 1997 OIOS proposal for the International Telecommunication Union (ITU) to conduct a study on integration of the United Nations global system and Mercure, at a cost of approximately $100,000, was no longer necessary given the degree of integration already achieved.

10. Mercure was reconfigured in 1996, with the support of ESA, to accommodate the emerging global standards for data transmission used by the internet. These standards had not yet evolved sufficiently at the initiation of the Mercure project in the early 1990s to be incorporated in the original design of the system. By 1995, however, UNEP and ESA had recognized that reconfiguration of Mercure was the most appropriate way forward to facilitate global exchange of environmental data and information in the future. The exponential growth of Internet technologies in recent years and the high degree of compatibility of UNEPnet with other global information initiatives has underscored the wisdom of the original decision to reconfigure.

II. BACKGROUND TO THE IMPLEMENTATION OF UNEPNET

11. UNEPnet comprises a set of electronic information management services tailored by UNEP and its global partners operating at the cutting edge of electronic information development. UNEPnet makes maximum use of the Mercure telecommunications system, and other compatible telecommunications systems,

to facilitate efficient access to, and the exchange of, environmental information for informed decision-making concerning the environment. UNEPnet can be characterized as the "environmental internet" of UNEP, since the standards adopted to manage and exchange environmental information electronically are those of the global internet, making the UNEPnet information architecture exceedingly compatible with current and projected developments of the established electronic information highways and the needs of an emerging global information society.

12. Given its information architecture, UNEPnet is eminently capable of providing services independent of Mercure, should adequate and equivalent telecommunications capacity exist at locations where exchange of data and information both with and within the UNEPnet network is desired. Mercure currently provides an otherwise unavailable, high-capacity telecommunications backbone, however, that enables UNEPnet to deliver a suite of global data and information exchange services at locations where telecommunications capacities are generally inadequate to serve the needs of UNEPnet participants. As a result of the dedicated capacity provided by Mercure, UNEPnet is able to guarantee delivery of, and access to, environmental data and information within the globally distributed UNEP secretariat and with its partners, without the increasing congestion associated with the global internet.

13. The obvious synergy between Mercure and UNEPnet has caused some confusion regarding the costs associated with developing the electronic information management capacities associated with UNEPnet and those directly associated with Mercure. There are distinct, and sometimes less distinct, divisions apparent in the costs associated with developing and operating a global environmental information system such as UNEPnet, and the cost of providing the underlying telecommunications capacity required to efficiently deliver both technical and administrative services in parallel. This point is examined in closer detail later in this document.

14. UNEPnet has been designed in a collaborative manner with support from institutions and information consortiums across the globe, including centres of excellence in Europe, Asia (Japan) and North America (the United States of America). Ongoing collaboration of particular significance in this regard includes the Group of Eight Environment and Natural Resources Management "virtual library of environment information", an initiative to harmonize the view of geographically dispersed, heterogeneous environmental data and information in a coherent manner, and participation in the development and deployment of the Committee of Earth Observation Satellites (CEOS) Information Locator System (CILS), with a view to increasing significantly the efficiency and flexibility of UNEP and its partners' information service points both locally and on the internet. The latter is coordinated by the Joint Research Centre of the European Union and the German Space Agency. UNEPnet continues to draw on expertise and advice in the best use of cutting-edge information technologies and the Mercure network from numerous additional partnerships, including the United States National Oceanic and Atmospheric Administration (NOAA), the United States National Aeronautics and Space Administration (NASA), ESA and the Japanese Space Agency.

III. CURRENT STATUS OF THE MERCURE PROJECT

15. The Mercure telecommunications system was officially signed over to UNEP by ESA with effect from 1 April 1997. The period of equipment warranty was correspondingly extended to 31 March 1999. A ceremony to formalize the hand-over and commissioning of Mercure from ESA to UNEP was held on 5 November 1997 in Geneva and was well attended by representatives of Governments participating in the project and the international press. Video-conference links were established at the inauguration between Geneva and Bangkok and also with Beijing and La Paz, to demonstrate the utility of Mercure as a modern management tool for an international organization and its partners. At the time of the inauguration, nine of 16 Mercure stations were fully operational. The two stations at UNEP headquarters in Nairobi had been under test since July 1997, but awaiting Intelsat approval to operate in Kenya.

16. The Mercure Governing Board, comprising members of the six donor countries, ESA and UNEP, has provided project oversight since its inception. The Board will remain in existence as an advisory body until September 1999, after which it will be dissolved. In the interim, the Board maintains responsibility for utilization of any remaining funds in the project contingency budget, arising primarily from exchange rate fluctuations. To date, some $320,000 in savings have been allocated in addition to the original donation to include purchase of spares and upgrading of certain Mercure facilities of benefit to participating countries.

17. In February 1998, the Mercure Board held a meeting with the Executive Director and mutual agreement was reached on the need to consolidate the existing Mercure network as a priority by completing any outstanding installations and raising the availability and reliability of Mercure-based services. A second priority on which agreement was reached was to focus on improved utilization of the existing network before any network expansion was considered. The latter proposal responds to a number of requests from developing countries seeking to improve access to environmental information through the installation of new UNEPnet and Mercure connections.

18. By mid-1998, all originally proposed Mercure installations, with the exception of Moscow, and two additional self-financed stations (Arendal and Vienna), had been completed, bringing to 15 the total number of operational sites. UNEP and the Russian Federation had already agreed in late 1997 that recent technological developments in the Russian Federation had significantly reduced the need for a Mercure installation in Moscow to achieve the desired level of connectivity to UNEPnet in the country. The remaining station has meanwhile been stored in Norway and will be redeployed at an appropriate location after consolidation of the existing network, taking into account the need to maximize integration of the United Nations global network with Mercure. Installation of Mercure infrastructure proved unexpectedly difficult in a number of participating countries, owing to restrictive customs regulations, shipping and supply problems and the reprogramming of specialized inputs from industrial contractors in Europe, once original installation schedules had been disrupted.

19. In January 1997, the Government of Kenya and UNEP had reached agreement in principle regarding the utilization of the Mercure system at UNEP headquarters for data services. This was formalized in a supplemental agreement between the Government and UNEP signed in January 1997. Operation of the Mercure stations in Kenya was however, subject to registration by Intelsat through its Kenya signatory, KPTC. The Supplemental Agreement on Mercure also made reference to establishing a services contract between UNEP and a Government nominee (ultimately this became KPTC) to assist UNEP with the operation and maintenance of the Mercure infrastructure at Gigiri. Agreement over the terms and conditions of the service contract proved critical in obtaining Kenya's authorization to use Mercure at UNEP headquarters. After protracted negotiations, Intelsat registration of the stations was successfully undertaken by KPTC on behalf of UNEP in March 1998, noting that UNEP was both the "owner" and "operator" of the system in Kenya. Negotiations were also completed over the terms and conditions of the service agreement between UNEP and KPTC in late April 1998, at which time Mercure could then be operated with the full endorsement of the Kenya Government. The annual cost of the services contract is $150,000, but this can be renegotiated in the future at the written request of either party.

20. During Mercure negotiations between Kenya and UNEP in February 1998, the Executive Director informed the Government that it was the intention of UNEP to seek additional authorization for voice telephony over Mercure and access to the system by all United Nations offices in Nairobi. Negotiations were subsequently undertaken between the two parties and UNEP awaits a proposal from Kenya on the terms and conditions under which these additional services would be authorized.

21. A funding proposal in line with the recommendation contained in paragraph 9 of Governing Council decision 19/30 was submitted to the Government of Norway in June 1997. The proposal sought financial resources sufficient for the establishment of a UNEPnet implementation centre in Arendal, Norway, that would also supplement the needs of Mercure implementation. The proposal was approved in principle in July 1997 to a total of 25.2 million Norwegian kroner (approximately $3.3 million at the time) over five years. A project document designed to deliver support to UNEPnet and Mercure was subsequently set up under a Norwegian trust fund to UNEP in December 1997 and activities began shortly thereafter in Arendal.

22. Two training workshops for technical operations staff at Mercure installations were held in 1998, in March and November, for participants from participating countries in the Indian Ocean and Atlantic Ocean regions respectively. Training covered maintenance, operations and utilization aspects of the UNEPnet and Mercure suite of facilities and services. Particular emphasis was placed on fulfilling the priorities of the consolidation and effective utilization of Mercure.

23. The reduction of costs for satellite transponder capacity in the Atlantic Ocean region anticipated in the report of the Executive Director at the nineteenth session of the UNEP Governing Council in 1997 (UNEP/GC.19/21, paragraph 20) has unfortunately not come about. The current cost remains at $262,000 per annum, in view of the special commercial lease from Intelsat provided by the United Nations Information Technology Services Division in New York. UNEP has approached the Division on several occasions since the

nineteenth session of the Governing Council, seeking to integrate Mercure transponder capacity with the more cost-effective capacity of United Nations Headquarters in New York as soon as possible. Spare capacity to accommodate UNEP on this more cost-effective transponder lease maintained by New York has, however, not become available, according to the Information Technology Services Division. Satellite transponder capacity over the Indian Ocean Region remains leased from Intelsat via the Information Technology Services Division at $95,000 per annum, for a capacity (5 Mhz) equivalent to that used over the Atlantic Ocean region.

24. In day-to-day operational terms, Mercure now carries all the Nairobi data, e-mail, Internet and high-capacity video-conference traffic to and from UNEP and all destinations outside Kenya. Daily e-mail traffic alone from UNEP headquarters amounts to some 100 megabytes in volume. By the end of 1998, Internet-based facsimile services will have been implemented over Mercure, so as significantly to increase their reliability and reduce costs from a number of sites within the global network. Mercure is thus the telecommunications backbone upon which all UNEP telecommunication links except its telephone service out of Kenya now depend and, conditional upon the outcome of as yet incomplete negotiations with the Government of Kenya regarding voice traffic over Mercure and access to the system by all United Nations agencies in Nairobi, this may become the case for other important activities of the United Nations family.

25. In September 1998, the Secretary-General submitted his report to the General Assembly on utilization of the development dividend (A/53/374), as discussed in his report entitled "Renewing the United Nations: a programme for reform" (A/51/950, in particular actions 21 and 22). Item C of the report on the utilization of the development dividend states: "Extension of access of developing countries and countries with economies in transition to Mercure satellite telecommunication system for interconnectivity in environmental information and data (United Nations Environment Programme)", contains a proposal on how Mercure could support the Secretary-General's thrust on "Networking for Development". The Mercure proposal, budgeted at $2,215,000 for the period 1999-2001, is one of eight proposals designed to complement priorities of the medium-term plan that was presented to the General Assembly for its consideration in September 1998. Should that proposal be accepted, the current status of the Mercure network and UNEPnet services would fully complement the objectives stated by Secretary-General. The outcome of the consideration of this matter by the General Assembly will be reported to the Governing Council at its twentieth session.

IV. INDICATIVE COST-BENEFIT ANALYSIS OF THE MERCURE PROJECT: SUMMARY OF FINDINGS

26. The following cost-benefit analysis of the Mercure system draws heavily on an analysis of UNEPnet operations undertaken by the Eurodata Foundation based in the United Kingdom. Eurodata is a consortium made up of representatives of the major European telecommunications operators and has substantial experience in assessing the costs and benefits of networks providing services such as those operating or intended over Mercure and UNEPnet.

27. UNEPnet is recognized as based on the Mercure satellite network owned by UNEP and operated with the assistance of Swisscom, the UNEPnet Implementation Centre in Norway, the United Nations Office at Nairobi and KPTC. Subcontracts have been let by the UNEPnet Implementation Centre for Internet management to RUNIT, a commercial arm of the Technical University in Tromso, Norway.

28. Because the Mercure network has only been providing operational services for a relatively short time, data on current savings have been difficult to obtain and several assumptions have had to be made on the basis of well-documented historical telecommunications traffic, growth statistics for usage in other networks and limited information from UNEP for 1998. Other services new to UNEP, such as video-conferencing, required assumptions to be made on likely future usage of the technology by the United Nations based on emerging usage patterns in the commercial sector around the world.

29. Five types of telecommunications traffic currently utilizing, or likely in the future to utilize, the UNEPnet and Mercure communications network were identified and examined in terms of costs and benefits:

(a) Data communications;

(b) Video-conferencing;

(c) Internal United Nations fax and voice telephony;

(d) External fax; and

(e) External voice telephony.

Each of these options are examined in some detail below, together with an explanation of the nature of each kind of traffic and its importance to UNEP in the future.

30. Overall, the cost-benefit analysis below shows clearly that the potential savings for UNEP from the use of Mercure and UNEPnet are substantially greater than the costs of operating the network. Mercure also makes possible modern management options, such as video-conference services, otherwise unavailable to many UNEP regional locations and those of its partners.

31. The cost of operating the Mercure network in the biennium 2000-2001 is estimated to be $3,690,000, taking into account funds from the Environment Programme and trust funds from Norway for the development of UNEPnet and Mercure services. Of this figure, the cost of providing common data telecommunications services such as e-mail, internet and fax is approximately $2,040,000 per biennium.

32. The potential savings are summarized in table 1 below:

Table 1

POTENTIAL SAVINGS IDENTIFIED

UNEPnet services	US$ per year	US$ per biennium
Data connections (IP)	640,000	1,280,000
Video conferences	1,370,000	2,740,000
Internal voice and fax	710,000	1,420,000
External fax	1,460,000	2,920,000
External voice	960,000	1,920,000
Total saving per annum	5,140,000	10,280,000

33. While these figures may appear on the high side, they nonetheless represent the likely benefit in terms of savings that would accrue to UNEP and the United Nations in general if the Mercure network could be used optimally and the organizations involved take on a modern approach to conducting international business. Using the same basis for analysis as included elsewhere in this report, the net present value (NPV) of the Mercure system is also extremely positive. Excluding the initial investment, NPV is in the vicinity of $19,800,000. Inclusive of the investment at current values, NPV is assessed at $10,500,000.

34. The figures outlined are impressive, but the practical reality is that maximum utilization of the UNEPnet and Mercure facilities is required to reap benefits of the magnitude described. It is also clear from the analysis that by instituting cost recovery among users for access to the system, and redirection of facsimile traffic from Nairobi via optimal routes, the present cost of operating the Mercure system can be more than met. Additional savings and cost-recovery options should assure the viability of the Mercure asset for the coming five years and more, and enable provision for investment in complementary technologies in the near future.

A. Costs

35. It is useful at the outset when assessing the costs and benefits of Mercure to draw a distinction as far as is possible (see paragraph 13 above) between the costs associated with the running of the Mercure telecommunications network and those associated primarily with the information management services of UNEPnet. UNEPnet is built around the availability of Mercure, but is not wholly dependent upon it. Many of the costs associated with UNEPnet would therefore still remain if UNEP is to communicate effectively with its global family, independent of whether Mercure provides the telecommunications backbone of the network or not. The costs of developing and maintaining UNEPnet information services have thus

been separated as far as is practicable in this assessment from those costs associated solely with providing Mercure telecommunications services such as to the globally distributed secretariat and its partners. It should be remembered, however, that, without Mercure, UNEPnet would serve a limited audience (mainly in the developed world) and would do so in a more expensive and less efficient manner than via Mercure. Some services would also become unavailable at sites where Mercure provides the only adequate basis for their provision.

36. For the biennium 2000-2001, the UNEPnet and Mercure costs are broken down as follows:

(a) Mercure operations costs: A total of $2,040,000 from the Environment Fund. This figure comprises the fixed costs for sub-contracts to lease satellite capacity from Intelsat ($720,000); network management services (Swisscom: $420,000); services and maintenance contract for the Mercure installation at UNEP headquarters (KPTC: $300,000); leased line access to UNEPnet for UNEP regional offices and principal partners not served directly by Mercure ($180,000); and global parts and maintenance contracts ($420,000) for the biennium since the Mercure warranty ends in March 1999. Given that these costs are for shared telecommunications services across UNEP and its administration, supplementing the environmental information management services of UNEPnet, it is proposed that the overall standing costs of $2,040,000 for the biennium be distributed among the divisions and offices of UNEP and funds for MASC from the United Nations Office at Nairobi budget;

(b) UNEPnet operations: Total of $1,900,000 from the Environment Fund and $1,400,000 from the Norwegian trust fund. The Division of Environmental Information, Assessment and Early Warning will provide funds from the programme budget to coordinate the strategic implementation, management and development of UNEPnet and Mercure, anticipated to be $1,900,000 for the 2000-2001 biennium. Of this sum, a less clearly distinguishable proportion can be attributed to coordinating Mercure activities as distinct from providing UNEPnet services. In addition to funds from the Environment Programme, the UNEPnet Implementation Centre in Arendal will receive $1,400,000 over the biennium, in accordance with the trust fund agreement, primarily to support UNEPnet services, utilization and development. The Centre does provide support to Mercure operations, but the high degree of synergy and dependence between the two initiatives once again renders it difficult to separate costs;

(c) Estimated total Mercure costs: $3,690,000 per biennium. This figure was arrived at by apportioning the relative contribution of both the Division of Environmental Information, Assessment and Early Warning Environment Fund and trust fund contributions to Mercure activities (estimated at 50 per cent), a total of $1,650,000 per biennium, and adding the recurrent costs in 36 (a) above.

B. Benefits

37. The benefits accruing from the UNEPnet and Mercure initiatives can be considered in two ways: in simple financial terms, and in terms related to the provision of efficiency-increasing services that would be otherwise

unobtainable without the network. While these two aspects are, in many instances, closely connected, in the following assessment an effort has been made, for the sake of simplicity, to isolate the purely financial benefits of available network services. Consideration is given to the five types of telecommunications listed in paragraph 29 above, and in the same order.

1. Data communications

38. This is referred to as Internet Protocol (IP) traffic: it includes e-mail traffic and electronic discussion groups; internet services such as World Wide Web access and on-line examination of the content of remote databases; database and computer file transfer services, or file transfer protocol (FTP); and desktop video-conferencing (Internet-based, computer-to-computer video communication).

39. UNEPnet is providing IP services today, primarily through Mercure, to a large number of locations and users around the world. The number of users by mid-1999 at each site in the current network is projected to be as follows: Arendal - 25; Geneva - 200; Vienna - 20; Paris - 80; Beijing - 700; Bangkok - 60; Almaty - 25; Hanoi - 75; Kathmandu - 40; Nairobi - 2800; Manama - 50; Maputo - 30; Niamey - 25; New York - 40; San Jose - 40; La Paz - 25; Havana - 50. The total number of users is thus estimated to be 4,285.

40. To assess the cost-benefit of the IP service, Eurodata examined the cost of equivalent commercial IP services to those available via UNEPnet and Mercure from 10 companies in the Germany, Ireland, Switzerland and the United Kingdom. Costs ranged between $188 and $1,181 per annum. Assuming some economies of scale, Eurodata estimated an annual price for data communications (i.e., IP services) of $150 per annum. This figure is rather low compared to the sites where the greatest volume of traffic would originate, but nonetheless indicative for the purpose of estimation. Using the figures provided, the estimated cost benefit of providing IP services globally is therefore:

(estimated number of users) X (connection price per user) = $624,750.

2. Video-conferencing

41. Although video-conferencing, or the provision of high-capacity, point-to-point video links between UNEPnet sites, is new to most of the UNEPnet/Mercure sites. for the purpose of the cost-benefit analysis, it is assumed that the United Nations and its partners will readily assimilate this new business model. Video-conferencing in industrialized countries has, however, demonstrated cost savings for multinational companies of between 25 and 30 per cent per annum by reducing travel costs. A modest 5 per cent reduction, for example, of current secretariat travel costs in Nairobi (which currently total approximately $5,000,000 per annum) could bring about savings of $250,000 per annum, with the opportunity to substantial furtner savings. Added to this is the obvious saving of staff time in undertaking travel.

42. The current analysis undertaken by Eurodata made a conservative evaluation of demand for video-conference services for the 16 UNEPnet/Mercure sites listed in paragraph 39 above. The estimated total was 1,900 hours per annum, which represented a realistic start, as most staff members in the

organizations concerned would first have to adapt to the concept of using video-conferencing as a modern management technique. The value of this service was again calculated by comparing the cost of achieving this level of video-conferencing through commercial operators. While charges vary considerably, the Eurodata survey of charges in seven countries in Europe revealed that a realistic average cost would be $725 per hour. The equivalent cost of the service provided through UNEPnet would therefore be: 1,900 hours @ $750 = $1,377,500.

43. The actual traffic potential is believed to be much higher than this figure, once staff become accustomed to the concept of video-conferencing. Assuming a future increase of significance in the use of video-conferencing by UNEP and its partners, the only cost-effective manner in which such usage could be achievable would be through a private network such as UNEPnet.

3. Internal United Nations fax and voice telephony

44. A significant subset of fax and telephone traffic from United Nations offices in Nairobi is directed to other United Nations sites. Source data from 1995 indicate traffic to Bangkok, Geneva, New York and Vienna as internal to the United Nations. UNEPnet and Mercure could eventually accommodate all or part of this traffic.

45. To assess the possible costs associated with internal United Nations traffic, Eurodata assumed that all internal traffic was currently routed through KPTC with standard call charges. The cost of return traffic was not included in the analysis. The cost of completing a total of approximately 22,500 call-minutes monthly to the four destinations is $59,332. The diversion of internal United Nations traffic via UNEPnet and Mercure would therefore result in savings of $711,979 per annum.

4. External fax

46. This category refers to all fax traffic originating at the United Nations offices at Nairobi, destined for non-United Nations sites via the public switched telephone network. An examination of all telephone traffic from UNEP headquarters in Gigiri indicates that approximately 55 per cent of traffic originates from facsimile machines. Each month is assumed therefore to result in 55,322 minutes of outgoing fax traffic. The analysis also assumes an average call duration of two minutes in order that a call set-up charge is taken into account. This results in an estimated 27,661 chargeable fax calls each month.

47. In this analysis, Mercure is assumed to carry fax traffic to a location not within UNEPnet, from where it will pass into the public telephone network at call rates operating at those destinations. Four destinations were compared for routing efficiency and cost: Kenya, Norway, Switzerland and the United States of America. To estimate the optimum routing and minimum costs, the number of calls destined for eight different regions of the world had first to be assessed from existing fax traffic data. Charges for calls to these eight regions from UNEP headquarters were then costed according to pricing information obtained by Eurodata Foundation from four representative telecommunications operators in the countries considered as the entry point

into the public switched telephone network: KPTC, Telenor (Norway), Swisscom and AT&T (United States of America). Assumptions also had to be made regarding varying charges with time of day (peak/off peak ratio), local taxes, discounts for volume of traffic, exchange rates and average call duration.

48. Taking all these elements into consideration, the following monthly costs were estimated for fax traffic routed through one operator:

Table 2

FAX TRAFFIC COSTS

Monthly cost in US$	KPTC	AT&T	Swisscom	Telenor
Single provider	160,792	54,105	46,692	38,621

49. Overall savings of around $122,000 per month - or $1,460,000 per annum - can be made by directing fax traffic via the lowest cost entry point into the public network. Since the transmittal of fax traffic is already approved as part of the agreement between the Government of Kenya and UNEP, work has been under way for some months to implement such a solution.

50. By optimizing the routing, further savings could be made, but this approach adds a significant administration burden associated with the design of the routing table.

5. External voice telephony

51. This category applies to voice telephone traffic originating at UNEP headquarters Nairobi, destined for non-United Nations sites via the public switched telephone network. If the remaining voice traffic were also routed via UNEPnet (subject to approval by local authorities), similar savings could be realized in addition to those coming from the fax network.

52. The analysis of past traffic from UNEP Headquarters indicates that the remaining 45 per cent of telephone traffic represents some 45,263 minutes per month. The net result is a total estimated number of calls amounting to 7,544.

53. The assumptions used in the analysis for voice traffic are generally the same as for the fax traffic with one or two important differences. First, the average call duration for international traffic is set at six minutes. If all calls were made through the lowest cost supplier in the manner describe for fax traffic, the savings over current costs would amount

to some $100,000 per month or $1,200,000 per annum. There are, however, other considerations necessary with regard to the avoidance of too many up and down-links between satellite earth stations and the satellites themselves, which can cause degradation of voice quality. These considerations are less significant for fax traffic and were not taken into account in the previous analysis. With these considerations in mind, table 3 below indicates in bold type the optimal (not necessarily the cheapest) routing and associated monthly costs for voice traffic destined to other parts of the world from UNEP headquarters in Nairobi.

Table 3

VOICE TRAFFIC FROM UNEP HEADQUARTERS IN NAIROBI

	MONTHLY COST IN UNITED STATES DOLLARS				
REGION	KPTC	AT&T	Swisscom	Telenor	Selected
Africa	**23,055**	15,456	13,835	12,385	23,055
Asia	**17,642**	8,241	6,313	5,318	17,642
Central America	7,156	**2,632**	3,299	3,066	2,632
Europe	33,682	11,250	5,004	**2,254**	2,254
Middle East	8,281	2,965	3,199	**2,285**	2,285
North America	33,008	**782**	3,796	3,098	782
Pacific	2,244	**765**	610	516	765
South America	6,489	**2176**	2,147	2,160	2,176
Total	131,557	44,268	44,268	31,082	51,592

54. Using the above routing table, and taking into account quality of voice service, realistic savings of around $80,000 per month or $960,000 per annum could be realized by voice traffic over the Mercure network.